Abstract

This thesis consists of two parts. In the first part, we study certain Ricci flow invariant nonnegative curvature conditions as given by B. Wilking. We begin by proving that any such nonnegative curvature implies nonnegative isotropic curvature in the Riemannian case and nonnegative orthogonal bisectional curvature in the Kähler case. For any closed $Ad_{SO(n,\mathbb{C})}$ invariant subset $S \subset \mathbf{so}(n, \mathbb{C})$ we consider the notion of positive curvature on S, which we call positive $S-$curvature. We show that the class of all such subsets can be naturally divided into two subclasses:

The first subclass consists of those sets S for which the following holds: If two Riemannian manifolds have positive $S-$curvature then their connected sum also admits a Riemannian metric of positive $S-$curvature.

The other subclass consists of those sets for which the normalized Ricci flow on a closed Riemannian manifold with positive $S-$curvature converges to a metric of constant positive sectional curvature.

In the second part of the thesis, we study the behavior of Ricci flow for a manifold having positive $S-$ curvature, where S is in the first subclass. More specifically, we study the Ricci flow for a special class of metrics on $S^{p+1} \times S^1$, $\ p \geq 4$, which have positive isotropic curvature.